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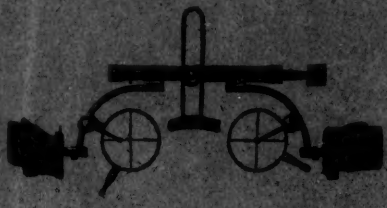

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THE BRITISH JOURNAL
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OPHTHALMOLOGY

SEPTEMBER, 1942

COMMUNICATIONS

A STATISTICAL ANALYSIS OF 3,219 PERSONS*
Certified Blind at the Regional Clinic for Certification of the Blind, Glasgow and South-West Scotland, During the Period 1929-1935

BY

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(Continued)

Chronic Septicaemia.

Chronic septicaemia was the fourth most important cause of blindness and accounted for 345 cases or 10·72 per cent. of the total. Both eyes were similarly affected in 312 instances. The sexes were equally affected. The mean age of onset was 33·9 years and that of blindness 46·3 years. The actual age distribution is given in Appendix Table E and shows that apart from the first few years the onset of the condition is strikingly evenly distributed

* "This report was intended for publication in the Special Reports Series of the Medical Research Council, but the subsequent advent of restrictions upon the issue of official publications without immediate bearing upon the war effort made it impossible for the Council to publish it during the war. It has therefore been released for publication in this journal."

throughout life, whereas as regards onset of blindness the numbers rise as age advances. The Kahn test was positive in only one case, but it must be remembered that this test was used as a criterion of diagnosis. The eye defects found were:

Uveitis	258 cases
Retinitis Proliferans, etc.	24 cases
Optic Nerve Atrophy	30 cases
Keratitis, Ulcerative	18 cases
Keratitis, Interstitial	6 cases
Keratitis, Other	6 cases
Intra-Ocular Haemorrhage	2 cases
Other	1 case

A study of the cases attributed to chronic septicaemia, focal sepsis or to auto-intoxication shows that this group has been used as a convenient diagnosis for the classification of a large number of cases whose precise aetiology was not clear. The defects in the cases so grouped have in common the appearance of inflammatory reaction in the tissues of the eye. It includes cases of uveitis not definitely attributable to syphilis, tuberculosis or other specific cause; cases of retinitis with exudate and tissue proliferation not due to diabetes, nephritis or vascular disease etc.; cases of secondary optic nerve atrophy in which there was no evidence of central nervous system disease or other cause and cases of keratitis not attributable to exogenous infection, syphilis, tuberculosis etc. It probably includes many cases in which a more detailed examination than was possible at the certifying clinic would have given a precise aetiology. It may be mentioned that in continental circles many of the cases in this group would have been considered tubercular in origin.

Injury.

Analysis of the causes of blindness in the present series shows that injury was responsible in 6·4 per cent. of the second eyes and 10·2 of the first eyes for loss of vision. Previous investigations into the causation of blindness in Glasgow and South-West Scotland have shown wide differences between the proportion of cases regarded as due to trauma. Freeland Fergus (1926), for example, found 18·25 per cent. of his cases blind as the result of injury, while only 7 per cent. of the cases reported by Marshall and Smith were placed in this category. The latter based their analysis on the cause of blindness in the second eye only, and, if this classification is adopted, no material difference is observed between their results and that of the present investigation. Such a classification, however, cannot be regarded as demonstrating the true relationship of injury to blindness. This fact is emphasised by the following statement in which the 366 cases of loss of vision associated with accidents are analysed:

	Cases	Percentage of Total Cases
Blindness due to Injury in Both Eyes ...	101	3·14
Blindness due to Injury complicated by Sympathetic Ophthalmia	67	2·08
Blindness due to Injury in the First Eye, Other Conditions Second Eye	158	4·91
Blindness due to Injury in the Second Eye, Other Conditions First Eye	29	0·90
Blindness due to Sympathetic Ophthalmia following Operations	11	0·34
All cases associated with Injury ...	366	11·37

Traumatic conditions alone or conditions directly resulting from injury caused blindness in only 168 cases or 5·22 per cent. of the total. A further 187 cases became blind as a result of injury associated with other causes. The more important causes of blindness in the uninjured eye were cataract (47 cases), myopia (40 cases), glaucoma (13 cases), uveitis (21 cases), vascular diseases of retinal vessels (13 cases), and keratitis (16 cases). It will be observed that in the great proportion of cases the conditions causing blindness in the uninjured eye are predominantly binocular in nature and would almost certainly have given rise to loss of vision in both eyes even if not complicated with injury. Therefore, injury in most of these 187 cases can be regarded only as a factor of incidental importance in so far as the question of total loss of vision is concerned.

The facts given show that in the present investigation only 168 cases or 5·22 per cent. of the total were strictly speaking blind as the result of traumatic conditions. This figure is considerably lower than that recorded in some aetiological surveys of blindness. Thus the returns furnished by the Scottish Board of Health to the Departmental Committee on the Causes and Prevention of Blindness showed that of the blind on the register at April, 1922, loss of vision in 7·2 per cent. was due to industrial accidents alone, while the analysis of 2,000 cases on the roll for England and Wales made in 1918 and quoted by the same Committee classified 12·3 per cent. of the cases as blind from all forms of injury. Resnick and Carris (p. 3) note that of the 100,000 blind in the United States approximately 15,000 are the industrial blind. The present investigation would appear to indicate, therefore, that, at least in so far as Glasgow and South-West Scotland is concerned, traumatic conditions do not occupy as prominent a position in the causation of total blindness as these figures indicate. While this is so, it should be emphasised that these remarks refer to total blindness from injury, and it is not possible to assess the influence which injury affecting one eye only may have exerted on the second aetiological factor. Further, the loss of vision in the one

eye by trauma resulted in a long period of defective vision before complete blindness occurred. Thus in the 158 cases blinded in the first eyes by injury an average period of 23 years elapsed between injury and loss of sight in one eye and total blindness.

Table XXIV shows the nature of the injury in the 355 cases associated with accidents.

TABLE XXIV

	Blindness in Both Eyes from Injury	Blindness from Injury One Eye, associated with Sympathetic Ophthalmia	Blindness One Eye Only		Total All Cases	
			First Eye	Second Eye		
						per cent.
Industrial Injury ...	67	18	79	12	176	48·09
Casual Injury ...	16	42	56	10	124	33·87
War Trauma ...	8	—	1	1	10	2·73
Birth Trauma ...	3	—	—	—	3	0·82
Sympathetic Ophthalmia following Operation ...	—	—	1	10	11	3·01
Not ascertained or a Combination of Different Injuries	16	7	22	6	42	11·48
Total	101	67	159	39	366	

The great majority of industrial accidents (76·6 per cent.) occurred, as would be expected, between the ages of 30 and 50 years, while more than 52·6 per cent. of those of a casual nature took place during the school and pre-school period. It is of interest to note that the age distribution of both industrial and casual injuries in this investigation follows very closely that quoted by the Departmental Committee on the Causes and Prevention of Blindness.

Industrial Injury.—Accidents at work were alone responsible for 170 cases or 46 per cent. of all cases of blindness from injury. Both eyes were directly or indirectly affected in 85 cases, while in 85 cases the vision of one eye only was lost. Industrial injury in combination with other injuries was also a factor in the other six cases. Thus, a total of 176 cases were associated with trauma during industry. Fully two-thirds of all the cases were engaged in mining or quarrying and in the metal industries. The numbers falling to those two occupational orders are very similar—59 cases

and 56 cases respectively—but when considered in relation to the population at risk an important difference is observed.

TABLE XXV

No.	Occupation Order (Census)	No. of Cases of Blindness			Number of Persons engaged in Occupations, Census, 1931	Rate of Blindness per 10,000		
		Both Eyes	One Eye Only	Total		Both Eyes	One Eye Only	Total
3	Mining and Quarrying Occupations	36	23	59	72,124	4·99	3·19	8·18
7	Metal Workers	28	28	56	145,397	1·93	1·93	3·85
1/31	Gainfully Occupied ...	85	91	176	1,172,384	0·73	0·78	1·50

The occupational hazard as regards loss of vision among those engaged in mining and quarrying is more than twice that of metal workers. No other occupation bears comparison. The only two which might be considered—Persons employed in Transport and Communication (16 cases) and Other and Not Defined Workers (18 cases)—show rates of blindness of 1·47 and 1·39 respectively per 10,000 occupied, which is below the average rate for all persons gainfully occupied.

No satisfactory statistics are at present available as to the relative frequency of eye injuries in different occupations. It is generally considered, however, that the risk of eye injury is greatest amongst those engaged in the Metal Working and Metal Producing Industries, a fact which has been emphasised by Resnick and Carris (1924) and de Lapersonne (1937). If this is the case the present analysis would appear to suggest that the nature of the injury in these industries is not so liable to result in serious damage to the eyes and complete loss of vision as that experienced by those employed in mining and quarrying occupations. A study of the nature of the industrial injuries producing blindness in the present series lends support to this view.

Loss of vision in 28·4 per cent. of all cases was due to explosions and falls or blows to the head, while in 60·2 per cent. it was caused by flying particles, tools, etc. When individual occupations are examined the table brings into relief the striking difference in the nature of the industrial injury leading to blindness in workers in mining and quarrying as compared with metal workers. Thus

TABLE XXVI

Occupation	No. of Cases of Blindness associated with Industrial Injury	Explosions	Falls or Blow to Head	Burns	Flying Particles, Tools, etc.
Workers in Mining and Quarrying ...	59	24	7	—	28
Metal Workers ...	56	5	6	8	37
Workers in Transport and Communication	16	2	2	2	10
Other and not defined Workers	18	1	1	4	12
All Other Occupations	27	1	1	6	19
Total	176	33 18·7%	17 9·7%	20 11·4%	106 60·2%

explosion and falls or blows to the head caused loss of sight in 52·5 per cent. of miners or quarry workers, while only 19·6 per cent. of the injuries in metal workers were of this nature. On the other hand flying particles or tools, etc., and burns from molten metal were responsible for 80·4 per cent. of the loss of vision in metal workers, as compared with 47·5 per cent. in the case of those engaged in mining or quarrying.

Casual Injury.—Blindness in both eyes resulted directly from casual injury in 16 cases and in the other 42 cases from casual injury complicated by sympathetic ophthalmia; this type of injury was responsible for loss of vision in one eye alone in 66 instances. The causes of injury, as would be expected, were of a very varied character, but it is worthy of note that blindness of both eyes was caused in ten cases by a fall or other head injury with resulting optic nerve atrophy (8 cases) and traumatic cataract and detachment of the retina in the remaining two cases.

Sympathetic Ophthalmia.—Sympathetic ophthalmia complicated injury in 67 cases and followed operation in a further 11 instances. A striking difference is to be observed in the relationship of this condition to casual as compared to industrial trauma. Thus sympathetic ophthalmia was a factor in the production of total blindness in 34 per cent. of cases of casual injury, while only 10 per cent. of industrial injuries were affected in this way. The average age of onset of sympathetic ophthalmia in the second eye was 32

years but it is worthy of note that the condition began in more than half the cases between the ages of 5 and 30 years. The mean age of blindness from this condition was 35 years. Males showed a significant excess although the proportion in this sex was not so high as in injury alone. It may be mentioned that enucleation of the injured eye had been performed in 36 of the 44 cases (82 per cent.) of casual injury, as compared with 10 of the 18 cases (56 per cent.) of sympathetic ophthalmia associated with injury at work, and in two of the five cases where the actual nature of the injury was not definitely ascertained.

War Injury.—There were only 8 cases included in the present series where blindness was attributed to war injury. It must be remembered, however, that this figure does not give an indication of the war blinded in Glasgow and South-West Scotland because such cases are in receipt of military pensions and, generally speaking, do not come to the Regional Clinic for examination.

Diabetes.—Diabetes was the cause of blindness in 43 cases (1·3 per cent. of the total) all of which were binocularly affected. There was a marked preponderance of the female sex, 81 per cent. being women. This is characteristic of diabetic ocular affections in those past middle life. In only two instances did the eye condition arise before the age of 40 years, these two cases falling into the age group 16-29 years. The average age of onset of the condition was 56·5 years and that of blindness 61·1 years. The eye defects found were as follows:

Cataract	26 cases
Retinitis	14 cases
Retro-bulbar Neuritis	2 cases
Cortical Lesion	1 case

As regards the cases of cataract, it is of course impossible to say whether these were actually all examples of cataract resulting from diabetes or whether they included cases of senile cataract in diabetics.

The examiners were of the opinion that there was some prospect of visual improvement in 20 of the 26 cases in which cataract was present.

Vascular Diseases (*Arteriosclerosis*).

Vascular disease was recorded as the cause of blindness in 100 cases (3·1 per cent.), and in 79 instances both eyes were similarly affected. This group includes conditions such as senile macular degeneration which might be more properly attributed to old age. The mean age of onset of the condition was 60·8 years and of blindness 63·5 years. Males were significantly in excess, the

proportion of this sex being 78·2 per cent. The defects found were:

Optic Nerve Atrophy	29 cases
Choroido-retinal degeneration	24 cases
Retinitis	22 cases
Brain Lesions	13 cases
Choroidal Sclerosis, etc	5 cases
Intra-ocular Haemorrhage	2 cases
Haemorrhagic Glaucoma	3 cases
Not Specified	2 cases

Intracranial Neoplasms.

There were 36 cases (1·1 per cent.) in which blindness was attributed to brain tumour, in all of which both eyes were similarly affected. As would be expected the defect in the vast majority of cases was optic nerve atrophy, only two cases being of different nature. The mean ages of onset and blindness were 34·5 and 36 years respectively, the cases having a fairly even age distribution. The sexes were equally affected. It is of interest to note that 13 of the cases had received previous surgical treatment.

Other Diseases of the Central Nervous System.

This category has been reserved for conditions of nervous origin which could not be attributed to tumour, syphilis, vascular disease or meningitis. It must be remembered, however, that neurological examination at the Regional Clinic was not possible. There were 37 cases placed in this group, the defects found being optic nerve atrophy in 34 instances; cortical lesion in two instances, the remaining case being one of lid paralysis.

OCULAR DEFECTS AND END RESULTS.

The 3,219 cases in this analysis have been studied so far mainly from the point of view of the causes responsible for loss of sight. There can, of course, be no question but that this aspect of the problem is of paramount importance, and action directed towards the elimination or reduction of these factors would be the most satisfactory approach to the prevention of blindness. Unfortunately, present knowledge does not permit of the application of preventive measures to many of the important causes. This fact does not mean, however, that no action is possible in cases of this nature, because by general or local treatment of the diseased conditions resulting from these causes blindness may be prevented and, further, when actual loss of vision has occurred operative measures may restore useful vision.

In view of this it is essential that any survey of blindness should include information on three different aspects of the problem, namely, the causes of blindness; the ocular diseases produced by

those causes (designated eye defects in this report); and, lastly, the end results of eye disease which have actually determined loss of sight by interfering with the function of the visuo-sensory apparatus. Another important reason for stating the eye defects and end results is that in this way a more satisfactory comparison is possible between the results of different analyses of blindness, especially when the systems of classification used are not of a uniform nature.

At a later stage in this report the relationship of eye defects and end results to the prevention and cure of blindness is dealt with, but certain other information regarding these conditions may now receive attention.

Defects.

The defects found in the 3,219 cases, together with the age and sex distribution, mean age of onset and of blindness are shown in extended form in Appendix Tables L and M, and again are given in Appendix Table N in their relationship to the different causes of blindness. It is interesting to note, however, that the six classes shown below were responsible for almost three-quarters of the cases.

	Cases	Percentage of Total Cases
Cataract and Aphakia	568	17·6
Myopia	525	16·3
Optic Nerve Atrophy	380	11·8
Ulcer of the Cornea	316	9·8
Primary Glaucoma	280	8·7
Irido-cyclitis	279	8·7
	2,348	72·9

Certain defects such as cataract, myopia, congenital anomalies, injuries and glaucoma have been sufficiently considered under "Causes," but particulars regarding the more important remaining defects may now be given.

Ulcer of the Cornea and Conjunctivitis.

Ulcer of the cornea (312 cases) and conjunctivitis (55 cases) were responsible for blindness in 11·5 per cent. of the total cases. The age distribution shown in Appendix Table M demonstrates that about two-thirds of these conditions arose before 15 years of age. The most important causes were ophthalmia neonatorum (99 cases), phlyctenular disease (83 cases), local infection (77 cases), infectious diseases (26 cases), trachoma (24 cases) and injury (22 cases). As would be expected, the end result in fully two-thirds was corneal opacity, but in 75 cases the eyeball was destroyed or removed.

Interstitial Keratitis.

Loss of sight resulted in 95 cases (2·95 per cent.) from interstitial keratitis. The most important cause was syphilis, 81 cases being due to the congenital form and 5 cases resulting from acquired syphilis. Of the remainder, 7 were due to unspecified endogenous disease and 2 to tuberculosis. The proportion of females with interstitial keratitis was 63·2 per cent., a rather surprising excess considering the important part played by syphilis. The end results were:

Corneal Opacity	41 cases
Occlusio-pupillae	23 cases
Cataract	14 cases
Choroiditis	11 cases
Optic Nerve Atrophy	2 cases
Enucleated Eye	3 cases
Unspecified	1 case

Endophthalmitis.

Under this heading are included cases of sympathetic ophthalmia and others in which the uveal tract and retina were involved. Endophthalmitis was recorded as the defect in 81 cases or 2·52 per cent. of the total. The chief cause was sympathetic ophthalmia, which was responsible for 80 per cent. of the cases blinded from endophthalmitis.

Iridocyclitis.

A total of 279 cases (8·7 per cent.) became blind as a result of iridocyclitis, the sexes being equally affected. The main causes were chronic septicaemia (211 cases), congenital syphilis (23 cases), and acquired syphilis (22 cases). The end results may be shown as follows:

Occlusio-Seclusio	81 cases
Cataract	79 cases
Glaucoma	33 cases
Corneal Opacity	27 cases
Detachment of the Retina	15 cases
Choroiditis	8 cases
Anophthalmos	34 cases
Optic Nerve Atrophy	2 cases

Degenerative Retinitis.

Degenerative retinitis was the defect found in 132 cases (4·1 per cent.), of which two-thirds occurred in the male sex. The mean age of onset was 34·7 years and of blindness 44 years. The main causes of this defect were abiotrophy (66 cases), vascular diseases (24 cases), "chronic septicaemia" (19 cases), and syphilis (18 cases). The defect in more than two-thirds of the cases was therefore pigmentary degeneration of the retina.

Exudative Retinitis.

There were 49 cases (1·5 per cent.) with this defect, the chief causes being vascular disease (22 cases), diabetes (14 cases) and nephritis (4 cases), while one case was due to pregnancy.

Detachment of the Retina.

Detachment of the retina was the defect in 35 cases, of whom 25 were males and 10 females. Five cases were due to injury. There were 28 cases, however, where no definite aetiological origin was found. The onset of the condition in two-thirds of this latter group was before 50 years; the detachment was binocular in 24 cases and males predominated, 69 per cent. of the patients being of this sex.

It is of importance to point out that, in addition to the 35 cases where detachment of the retina was recorded as the defect, there were 114 cases where this condition was a complication of other defects. Myopia was the most important cause of this group, accounting for 66 cases, but 20 cases occurred as a post-operative complication, while 22 cases were associated with choroiditis.

Choroiditis.

The defect in 109 cases was choroiditis and of these cases 58 per cent. were of the male sex. The most important causes were chronic septicaemia (46 cases), congenital syphilis (26 cases), and acquired syphilis (28 cases). Choroiditis was a complication in a further 405 cases, in 288 of whom it was associated with myopia.

Optic Nerve Atrophy.

Optic nerve atrophy was the third most important defect in the present series, accounting for 380 cases or 11·8 per cent. of the total. The main causes were as follows:

Syphilis, Acquired	131 cases
Syphilis, Congenital	13 cases
Chronic Septicaemia and Other Infectious Conditions	45 cases
Intracranial Neoplasm	34 cases
Disease of the Central Nervous System	33 cases
Meningitis	32 cases
Vascular Disease	28 cases
Abiotrophy	18 cases

Optic nerve atrophy was in addition a complication or end result in 249 cases, the chief cause of which was glaucoma (113 cases).

End Results.

The following statement sets out the end results in the various cases:

End Result	No. of Cases	Percentage of Total
Cataract	1,046	32·50
Optic Nerve Atrophy	566	17·58
Choroido-retinal Degeneration	413	12·83
Corneal Opacity	411	12·77
Anophthalmos and Phthisis Bulbi	235	7·30
Occlusio-Seclusio	197	6·12
Detachment of Retina	117	3·63
Glaucoma	99	3·08
*Congenital Conditions	43	1·34
Cortical and Tract Lesions	11	0·34
Ptosis and Lid Conditions	3	0·09
Intra-ocular Haemorrhage	2	0·06
Others	76	2·36
All Cases	3,219	100·00

* Congenital conditions such as buphthalmos, cataract, anophthalmos, etc., have been excluded and are shown under other appropriate headings in the table.

It will be observed that cataract was by far the most common end result, accounting for about one-third of the total cases. The importance of this condition in relation to the possibility of restoration of vision is dealt with in some detail in a later section of this report.

V.—PREVENTION AND CURE OF BLINDNESS.

All investigations into the causation of blindness have as their ultimate object an attempt to collect information which will assist in the prevention or reduction of blindness. The present paper cannot be considered complete, therefore, without some further reference to this aspect of the subject, particularly in its relationship to the cases which have been analysed.

The measures by which the incidence of blindness may be reduced cover a wide field, but, broadly speaking, they fall into two main categories—preventive measures and curative measures. Measures of prevention, strictly speaking, aim at the removal of the actual causes of blindness; they include efforts directed towards the improvement of environmental conditions and nutrition, education in social and general hygiene, the combating and control of the venereal diseases, regulations designed to safeguard those employed in industry, and eugenics, all of which fall within the province of preventive medicine and are measures of what may be called True Prevention. In addition, however, prevention in relation to blindness must take into account the efforts of general medicine which by the successful treatment of bodily disease or local ocular affections may prevent serious damage to the eyes. The attack in the latter cases is against disease as distinguished from cause and for the present purposes preventive measures of

this type may be designated Prevention by Treatment in contrast to true prevention. The second category, Curative Measures, deals with the end results of disease which by interfering with function have produced loss of vision and have as their aim the restoration of vision.

Present knowledge does not allow of the satisfactory adaptation of these different measures to all cases but their application in the reduction of the number of the blind is well illustrated by a consideration of a condition such as ophthalmia neonatorum. Thus, the campaign against the venereal diseases, the effective ante-natal treatment of pregnant women suffering from gonorrhoea, and the prophylactic treatment of the eyes of the newly born play an important part in reducing the incidence of this disease by attacking the cause. Further, should the eyes become affected, competent local treatment may prevent damage resulting in visual defect; and, lastly, in certain instances where loss of vision has actually occurred it may be possible by operative measures, such as corneal grafting, to restore vision.

It is obviously difficult to draw a hard and fast line between what has so far been called true prevention and prevention by treatment or, in certain instances, between preventive and curative measures, but these different categories are sufficiently clearly defined to allow of their use for descriptive purposes. Accordingly, the reduction of blindness in relation to the cases which have been analysed may be considered under these three headings.

True Prevention.

It is extremely difficult to assess in a satisfactory manner the influence on the incidence of blindness of those factors which have been included under the heading True Prevention. It may be of interest, however, to consider what information bearing on the subject is forthcoming from a study of the general trend of blindness in Glasgow and South-West Scotland in the first place and thereafter of the cases at present under analysis.

The number of blind persons on the Register of the Blind for Glasgow and South-West Scotland for each year since the passing of the Blind Persons Act 1920, is given below in three age groups (Table XXVII).

The figures are obtained from the return of the Department of Health for Scotland of all registered blind persons. The total number of the blind on the Register increased steadily up to 1930, since when it has remained more or less stationary although there have been yearly fluctuations. When the blind at different age periods are considered, it will be observed that the number of the blind in the age group 16-49 years increased progressively from

TABLE XXVII

Year	Pre-School and School Age: 0-15 Years	Training and Employment Period: 16-49 Years	Pension Period: 50 Years and Over	Age Not stated	Total All Ages
1921	203	975	1,250	—	2,428
1922	211	998	1,367	4	2,580
1923	206	*	*		*
1924	202	1,024	1,524	4	2,754
1925	177	1,087	1,645	4	2,913
1926	169	1,110	1,772	—	3,051
1927	158	1,137	1,921	—	3,216
1928	154	1,248	2,476	—	3,878
1929	141	1,264	2,786	2	4,193
1930	141	1,336	2,856	—	4,333
1931	114	1,297	2,824	—	4,235
1932	120	1,357	2,940	—	4,417
1933	112	1,342	2,802	—	4,256
1934	101	1,276	2,638	—	4,015
1935	97	1,256	2,692	—	4,045
1936	94	1,252	2,825	—	4,171
1937	89	1,258	3,002	—	4,349
1938	78	1,306	3,100	—	4,484

* Figures not available

1921 to reach a maximum in 1932, since when the numbers have tended to decrease, while the number of blind persons over 50 years of age has shown a gradual but more or less steady increase. The initial increase in both these groups was probably more apparent than real and was due to the better ascertainment of blindness following the passing of the Blind Persons Act and the provisions made thereunder.

The table brings out very clearly the striking and continued fall in blindness in the earlier years of life. It will be observed that the number of blind of 15 years and under was 203 or 2·56 per 10,000 of the population of this age in 1921, as compared with 114 or 1·48 per 10,000 in 1931, while in 1936 the figures were 78 and 1·01 per 10,000. These figures of blindness in the pre-school and school period gain in importance when it is remembered that official returns in respect of children may be regarded as reasonably accurate, Education Committees being responsible for blind children of school age.

The decline in blindness in the earlier years has been noted in other parts of the United Kingdom and has resulted from a variety

of causes, among which the declining birth-rate must be included. There can be no question, however, that certain diseases which formerly played an important rôle in the production of blindness in early life have either declined in incidence or the risk of resultant loss of vision has been lessened. Chief among these conditions are ophthalmia neonatorum and congenital syphilis. Illustration of the improvement as regards ophthalmia neonatorum (gonococcal) and congenital syphilis is afforded by the statistics of these diseases over a period of years in Glasgow. The number of new cases among infants under one year receiving treatment for congenital syphilis in Glasgow is set out in Table XXVIII.

TABLE XXVIII

New Cases of Congenital Syphilis under One Year in Glasgow

Year	No of Cases	No. of Births	Rate Congenital Syphilis per 1,000 Births
1922	335	28,298	11·84
1923	269	26,710	10·07
1924	202	25,330	7·97
1925	211	25,416	8·30
1926	174	24,541	7·13
1927	119	23,578	5·05
1928	113	23,649	4·78
1929	154	22,799	6·75
1930	128	23,322	5·49
1931	73	22,926	3·18
1932	72	22,732	3·17
1933	67	21,361	3·14
1934	65	21,822	2·98
1935	53	22,102	2·40
1936	60	22,273	2·24
1937	36	22,176	1·62

There has been a continuous fall in new cases of congenital syphilis from 11·84 per 1,000 births in 1922 to 1·62 in 1937.

As regards ophthalmia neonatorum of gonococcal origin, a striking improvement has been observed in Glasgow, not only in the actual number notified but in the reduction in impaired vision resulting from the disease. This improvement is clearly shown in Table XXIX.

TABLE XXIX

Notified Cases in Glasgow of Ophthalmia Neonatorum (Gonococcal) in Three Quinquennial Periods

Period	Births	Cases of Ophthalmia Neonatorum (Gonococcal) notified	Rate per 1,000 Births	Results of Treatment				Total Cases with Vision Impaired or Destroyed	Percentage of Total Notified
				Blind		Impaired Vision			
				Both Eyes	One Eye	Both Eyes	One Eye		
1917-21	135,727	740	5·45	3	22	24	63	112	15·1
*1922-26	130,295	284	2·18	2	2	4	15	23	8·1
1927-31	116,274	223	1·92	—	1	—	2	3	1·4
1932-36	110,290	154	1·40	—	—	—	2	2	1·3

* Midwives instructed in July, 1921, to instil 1 per cent. silver nitrate into the eyes of all newly born infants.

There were more than 5 cases of gonococcal ophthalmia neonatorum per 1,000 births during the quinquennial period 1917-21 and the vision in 15 per cent. of the notified cases was either destroyed or seriously impaired. The period following the regulation requiring midwives to instil silver salts into the eyes of all newly born infants showed a fall in the rate of ophthalmia neonatorum by more than half, while in only 8 per cent. of the cases was there destruction or impairment of vision. The improvement is continued in the more recent period and it is noteworthy that of all the notified cases during 1932-36 only 2 cases showed some impairment in vision in one eye.

From these returns for Glasgow it is evident that definite progress in the reduction of congenital syphilis and ophthalmia neonatorum has already been made and it is reasonable to expect that the decline in these conditions will continue in future years.

Attention may now be directed to the information available from the present analysis in relation to the considerations dealt with above. For this purpose the various causes have been studied in accordance with (*a*) the decade in which the onset of the condition leading to loss of vision occurred, and (*b*) the decade in which actual blindness took place. The results of this study for all the more important causes of blindness are given in Appendix Table O.

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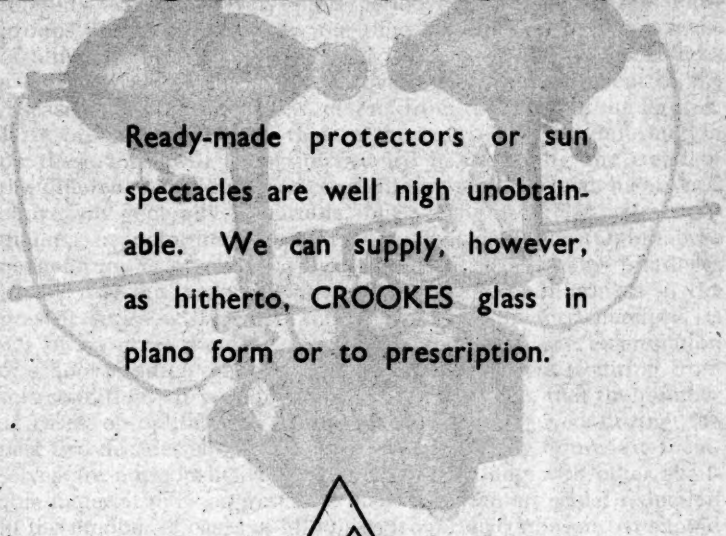

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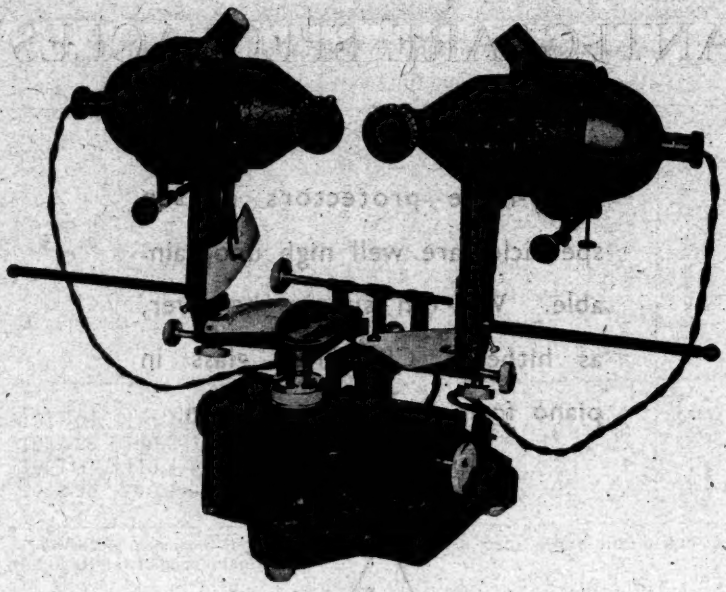

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It is not possible to draw any satisfactory conclusions from these figures. Systematic examination of the blind has been in operation for only a comparatively short period and the numbers in most groups are small. Further, the time lag between the occurrence of blindness and certification, and the fact that in many instances a considerable period elapses between the commencement of the disease and actual blindness, detract from the value of the figures. It is probable, however, that in the course of time information on these lines will be of importance in indicating the trend of the different individual causes of blindness. The facts mentioned above are generally applicable, but the figures relating to ophthalmia neonatorum deserve further consideration. Ophthalmia neonatorum is of course essentially a disease causing blindness in the first few years of life—the mean age of blindness in the present series is 9 years—and the time lag factor, therefore, is not of so great moment. Further, the compulsory examination of school children tends to bring to light blindness resulting from this condition. It is of interest to note, therefore, that the number of cases of ophthalmia neonatorum which occurred during the past two decades shows a decided decrease. The figures by themselves are not conclusive, but when taken along with other available material they suggest that there has been an actual reduction in the number of cases of blindness from this condition. It should be remembered, however, that some of those who went blind in 1920-29 and 1930-35 may not have found their way to the clinic before 1935.

It has been stated that, generally speaking, difficulty is experienced in assessing in a satisfactory way the influence on the incidence of blindness of factors called true prevention. Before leaving this subject, however, it may be of interest to study, in relation to the present series of cases, the questions of eugenics and sterilisation and of the use of protective devices in industry.

Eugenics and Sterilisation.

Measures of eugenics in the form of abstention from parenthood and of sterilisation have been suggested as a potent means of reducing the number of blind. The German Laws of 1933 for the compulsory sterilisation of cases of hereditary blindness have drawn particular attention to the subject. It may be worth while attempting to estimate, therefore, the possible effects to be expected from such measures from the figures in this report.

The statistics given in the Report of the International Association for the Prevention of Blindness (1937) show extraordinary variations in the proportion of cases attributed to congenital and hereditary causes in different countries. These causes are stated to be responsible for less than 5 per cent. of the cases of blindness

in Greece, Japan and Switzerland; for between 5 and 10 per cent. of the cases in England and Wales, France, Latvia, Lithuania; for between 10 and 15 per cent. in Bulgaria, Germany (born blind), Hungary, Netherlands and Scotland; and for over 20 per cent. in Australia, England and Wales, and United States of America (young people). It is obvious that such gross variations in some of the cases, at least, depend on factors such as the standards of blindness adopted, the age group of the blind persons examined and the classification adopted for the causes of blindness, and do not indicate true variations in the incidence of these diseases.

In the present group of cases the cause groups in which hereditary defects of the germ plasm may play a part are myopia, congenital anomalies and that designated abiotrophy, which are responsible between them for 23·79 per cent. of the cases. If the cases of hereditary syphilis are included the figure is raised to 28·51 per cent. Any measure which can have an influence on such a large proportion of the blind requires serious consideration. The fact that myopia has such a wide distribution in the general population; that it is transmitted as a recessive defect and that in the present state of our knowledge it is difficult to recognise in the early years of life the type of myopia which will lead to progressive loss of vision, makes the application of measures of sterilisation impracticable. When it is considered that the mean age of blindness in the cases of myopia in this report was 52 years, even measures of voluntary sterilisation would seem to be a waste of potentially useful citizens.

With regard to congenital anomalies and abiotrophy which between them account for 7·45 per cent. of the cases in this group, it has been shown that in only a proportion was there a history of similar defect in the family, the cases with such a history amounting to 3 per cent. of the series. When it is remembered that in a considerable proportion of these the defect was transmitted as recessive, the probable effect of sterilisation on the incidence of blindness in the population must amount to much less than 3 per cent., a reduction which might well be more than counterbalanced by the loss of useful healthy citizens.

Hereditary syphilis has already been dealt with from the point of view of therapeutics, but there is no doubt that more effective control of the health of those about to be married might be expected to produce a reduction in the number of blind from this cause to supplement the reduction obtained from the campaign against the disease in the population.

Protective Devices in Industry.

Considerable attention has been paid in recent years to the use of protective devices in connection with certain industrial processes

known to be particularly liable to be associated with eye injury. The Factory Act, 1937, Secton 49, for example, empowers the Secretary of State to make regulations specifying certain processes which involve a special risk to the eyes and where suitable goggles or effective screens must be provided. The Protection of Eyes Regulations, 1938, have been made under this section and their provisions include the following processes:

Dry grinding of metals or articles of metal applied by hand to a revolving wheel or disc driven by mechanical power.

Turning (external or internal) of non-ferrous metals, or of cast iron, or of articles of such metals or such iron, where the work is done dry, other than precision turning where the use of goggles or a screen would seriously interfere with the work, or turning by means of hand tools.

Welding or cutting of metals by means of an electrical, oxy-acetylene or similar process.

The following processes when carried on by means of hand tools or other portable tools:

Fettling of metal castings involving the removal of metal.

Cutting out or cutting off (not including drilling or punching back) of cold rivets or bolts from boilers or other plant or from ships.

Chipping or scaling of boilers or ships' plates.

Breaking or dressing of stone, concrete or slag.

The present series of cases may, therefore, be examined in the light of prevention in this way. It has been shown earlier in the report that 176 cases of blindness were either directly or indirectly due to industrial injury. Of this number, 50 cases were due to explosions, falls or blows and were not, therefore, generally speaking, susceptible to mass protection and dependent in part at least on the indiscretion of the individual. On the other hand, 106 instances of loss of vision were attributed to flying particles, tools, etc., and another 20 cases to burns either from lime or molten metal. It is possible therefore that 60 per cent. to 70 per cent. of the cases blind from industrial injury might have been prevented if preventive devices had been used. It must be remembered, however, that one eye only was injured in a considerable proportion of cases and loss of vision in the uninjured eye was due in most cases to conditions such as cataract, myopia and glaucoma, which would almost certainly have given rise to blindness in both eyes, even if not complicated by injury. It may be, therefore, that the effect of protective measures in industry on the number of the blind is not so great as would appear at first to be the case.

This refers, of course, to complete loss of sight and it is not possible to assess the influence that injury affecting one eye only may have exerted on the second aetiological factor. Further, the loss of vision in one eye by injury may result in a long period of defective vision before complete blindness occurs.

Sympathetic Ophthalmia.

Another aspect of the subject concerns prevention of blindness from sympathetic ophthalmia associated with injury. This refers, of course, to non-industrial as well as industrial injury. There were 67 cases in the present series in which sympathetic ophthalmia complicated injury. The injury in 42 cases was of a casual nature, in 18 cases it occurred at work, while in the remaining 7 cases the actual nature of the injury was not ascertained. Sympathetic ophthalmia is a complication which broadly speaking can be prevented by skilful treatment involving early removal of the injured eye, and the figures in this report would indicate, therefore, that the ophthalmic surgeon can play an important part in the reduction of blindness from this cause.

Prevention by Treatment.

The medical case record completed for each patient examined at the Regional Clinic includes certain questions which have a special bearing from the standpoint of previous treatment. Thus the examining surgeon is asked to indicate whether the patient has had special ophthalmic treatment, its nature—medical or surgical—and whether this treatment was complete or incomplete. In addition, questions require to be answered regarding previous anti-syphilitic treatment where this is applicable. An attempt has been made, therefore, from the information relating to these various questions to assess the adequacy of the steps taken to prevent blindness in the 3,219 cases under consideration. The results of this study may be conveniently dealt with under two main headings—treatment in relation to general disease of the body, and treatment as applied to disease of the eye itself.

Treatment of General Disease of the Body.

Syphilis in either its congenital or acquired form is the only condition which falls to be dealt with under this heading. This disease, in the opinion of the ophthalmologists, was responsible for blindness in 348 cases, but information regarding previous treatment is not available for 46 of this number. Of the remaining 302 patients, 209 or 69·2 per cent. had received previous anti-syphilitic treatment, and with the exception of six cases this included injection therapy. If consideration be restricted to only those with a positive Kahn reaction, the proportion with previous

treatment is 56·8 per cent. These figures indicate that a comparatively large percentage of the cases which became blind from syphilis had received previous treatment on modern lines. It is, of course, not possible to assess the adequacy or otherwise of the treatment, and it must be remembered that the fact that 30·8 per cent. had not received treatment cannot be taken as a measure of untreated syphilis in the general population.

Treatment of Ocular Disease.

It has been previously pointed out that the question of treatment in local ocular conditions has reference to the manifestations of disease on the visuo-sensory apparatus, called eye defects in the medical case-record, in contrast to the actual cause of these manifestations. As, however, the particular cause of any ocular condition has a definite influence on the results to be expected from treatment, the 3,219 cases have been analysed from the point of view of previous special ophthalmic treatment, according to both the aetiological classification of blindness and to defects.

Information is available for 3,117 of the total cases, and of this number 490, or 15·7 per cent., had no previous special treatment, while a further 388, or 12·5 per cent., had in the opinion of the examiners not completed their treatment. It is, of course, generally recognised that treatment in certain instances would have had no effect in preventing blindness. Thus, generally speaking, the ocular effects of the group General Disease are not amenable to either local or general treatment; while, on the other hand, adequate treatment of cases falling into the two large cause groups —infectious and traumatic and chemico-toxic conditions—may have an important influence in preventing blindness. The cases included in the remaining large group, congenital and undetermined conditions, fall into one or other of these two categories. The lack of previous treatment in senile cataract, for instance, does not prejudice the ultimate restoration of vision, but this is not so in the case of congenital cataract, congenital dislocation of the lens, buphthalmos, glaucoma, or detachment of the retina. It is possible, therefore, to divide the cases from the point of view of the cause of blindness into two groups—one in which the absence of previous treatment was unlikely to affect the ultimate progress, and the other in which previous treatment may be regarded as of definite importance in relation to the preservation of vision. The results of this analysis are shown in Table XXX.

The figures are interesting as showing that only a comparatively small proportion (280 cases or 17·1 per cent.) of those cases in which it might be expected that treatment would have contributed to the prevention of blindness had failed to obtain advice or complete their treatment. On the other hand, those in which treatment

TABLE XXX

	No. of Cases	No Previous Treatment		Treatment Incomplete	
		Number	Percentage	Number	Percentage
Cases where previous treatment not likely to prevent blindness	1,483	351	23·7	247	16·6
Cases where previous treatment of importance in preventing blindness ...	1,634	139	8·5	141	8·6
All Cases	3,117	490	15·7	388	12·45

was unlikely to be effective reveal a much higher proportion. In fact, of all cases with no previous treatment, about two-thirds fall into the latter category. It must be pointed out in assessing these results that they refer to special ophthalmic treatment and take no cognisance of other forms of medical treatment which may well have been sufficient. It seems, however, not unreasonable to expect that all persons affected by a condition likely to cause blindness should have the benefit of a second opinion. The figures as regards treatment may be considered on the whole reasonably good, especially when it is remembered that age in many instances is an important factor.

So far the question of local treatment and blindness has been dealt with from the point of view of the actual causes of loss of vision. As has been pointed out, however, prevention by treatment, strictly speaking, deals with disease of the eye, and it is in relation to defects found at examination, therefore, that the question should be considered.

Table XXXI is, therefore, produced to show the more important defects with the proportion of cases which had received either no treatment or incomplete treatment.

As was found when dealing with Causes, those conditions, namely, glaucoma, irido-cyclitis, corneal ulceration, inflammation of conjunctiva, interstitial keratitis, detachment of retina, endophthalmitis, and wounds, which were likely to prove amenable to therapeutic measures show—with the single exception of congenital anomalies—the lower proportions without treatment. These

TABLE XXXI

Defect	Total Cases	No Previous Treatment				Treatment Incomplete	
		No.	Percentage	Standard Error of Difference from mean	Significance of Difference from mean	No.	Percentage
Cataract	548	185	33·76	±1·56	+	180	32·84
Cortical and Tract Lesions	22	7	31·81	±7·76	d	1	4·54
Congenital Anomalies ...	140	31	22·14	±3·08	d	22	15·71
Myopia	499	105	21·04	±1·63	+	43	8·62
Choroiditis	108	13	12·03	±3·50	O	7	6·48
Retinitis, Degenerative ...	131	15	11·44	±3·18	O	6	4·58
Optic Atrophy and Neuritis	367	39	10·63	±1·90	−	33	8·99
Retinitis, Exudative ...	48	5	10·41	±5·25	O	4	8·33
Glaucoma	275	26	9·45	±2·20	d	12	4·36
Irido-cyclitis	273	25	9·20	±2·20	d	15	5·49
Corneal Ulcer	306	25	8·20	±2·08	−	28	9·15
Inflammation of Conjunctiva	54	2	3·70	±4·95	d	3	5·56
Interstitial Keratitis ...	87	3	3·45	±3·90	−	13	14·94
Detachment of Retina ...	35	1	2·85	±6·15	d	1	2·85
Endophthalmitis, etc. ...	79	1	1·20	±4·10	−	2	2·40
Wounds of Eye	85	1	0·98	±3·95	−	10	9·8
Others	60	6	10·00	±4·70	O	8	13·33
All Defects	3,117	490	15·72			388	12·45

(Significantly in excess of mean +; significantly below mean −; not significant O; d=doubtful significance—between 2 and 3 times Standard Error).

remarks, generally speaking, hold good for completeness of treatment also, but here the issue is somewhat confused by the fact that the question of prognosis has entered into the expressed opinion of the examiner.

Curative Measures.

It is generally recognised that present knowledge does not allow of the application of preventive measures to all conditions which give rise to blindness. While this is so, it is possible in many instances to restore useful vision by operative means or, in some cases where previous treatment has been neglected, by appropriate medical treatment, and the cases under analysis may now be

studied from this point of view. In the first place, however, the method by which the necessary data have been obtained and are presented requires some explanation.

Information regarding the prospects of the restoration of vision is forthcoming from an analysis of the answers given by the examining surgeons to the question on the medical case-record—"Would treatment probably cure blindness?" Curative measures are, of course, concerned with, and must be studied in relation to, the end results of disease. In order to obtain data regarding these end results it has been necessary to consider the complications affecting each case. Complications are coded in the medical case-record in the following groups: no complications; corneal opacity or staphyloma; occlusio or seclusio; cataract; optic nerve atrophy or neuritis; anophthalmos and phthisis bulbi; secondary glaucoma; and others. The group "no complications," together with the special category congenital anomalies had to be separately analysed because therein defects are in fact end results. An illustration will perhaps make the position clear. Cataract may be secondary to an inflammatory condition of the eye and is then coded as a complication. It may, however, occur as a primary condition, when it is coded as an eye defect with or without complications. Finally, it may exist in the congenital form and is then coded with other congenital anomalies in a separate grouping on the medical case-record. In passing, it may be mentioned that

TABLE XXXII

Number of Cases which Treatment might remove from Blind Category according to End Results

Condition	No. of Cases	Treatment might Improve			Percentage might Improve
		Recommended	Not Recommended	Total	
Corneal Opacity	411	37	1	38	9·2
Occlusio-Seclusio... ...	197	16	1	17	8·6
Cataract	1,046	393	69	462	44·2
Detachment of Retina ...	117	3	1	4	3·4
Choroido-Retinal Disease	413	27	7	34	8·2
Optic Nerve Atrophy, etc.	566	20	–	20	3·5
Glaucoma	99	13	2	15	15·2
Others	370	11	–	11	3·0
All Cases	3,219	520	81	601	18·7

unfortunately no provision has been made on the medical case-record for coding complications associated with congenital anomalies.

From the data so obtained Table XXXII has been produced, to show the number of cases which, in the opinion of the examiner, might be expected to benefit by further treatment.

It was the opinion of the ophthalmologists that in 601 or 18·7 per cent. of the total cases treatment might improve vision to such a degree as to warrant removal from the blind category. As, however, in 81 it was considered inadvisable to urge the patient to undergo treatment, only 520, or 16·2 per cent., of the cases can be properly considered from the point of view of cure of blindness. The nature of the treatment recommended in this latter group and the likelihood of restoration of vision is shown in Table XXXIII.

TABLE XXXIII

Condition	No. of Cases	Medical Treatment			Surgical Treatment			Optical Treatment	
		No. of Cases	Prognosis		No. of Cases	Prognosis		No. of Cases	Doubtful Prognosis
			Good	Doubtful		Good	Doubtful		
Corneal Opacity	37	20	1	19	17	4	13	–	–
Occlusio-Seclusio ...	16	7	–	7	9	1	8	–	–
Cataract	393	–	–	–	389	142	247	4	4
Detachment of Retina ...	3	–	–	–	3	–	3	–	–
Choroido-Retinal Disease	27	23	–	23	–	–	–	4	4
Optic Nerve Atrophy ...	20	19	3	16	1	–	1	–	–
Glaucoma	13	7	–	7	6	–	6	–	–
Others	11	9	1	8	1	1	–	1	1
Total	520	85	5	80	426	148	278	9	9

The treatment recommended in the great majority of instances was of a surgical nature, 426 of the cases or 81·9 per cent. falling into this category. Further, the prognosis from the point of view of restoration of vision was regarded by the ophthalmologists as favourable in 34·7 per cent. of this group as compared with 5·3 per cent. where treatment was of a non-surgical nature. It will be observed that cataract, either primary or secondary, accounts for 393, or fully three-quarters of the total cases and for almost

all those in which restoration of vision was considered probable, while corneal opacity or occlusio-seclusio make up the greater part of the remaining cases. These figures emphasise the fact that it is only in cases with opacity of the transparent media that treatment offers a prospect of restoration of sight. As regards medical treatment, it should be pointed out that the three cases of optic nerve atrophy shown as likely to benefit by medical treatment were of the nature of toxic amblyopia.

Reasons for Failure to Obtain Treatment.

It has been shown earlier in this paper that of the total cases analysed 15·7 per cent. had received no special ophthalmic treatment prior to blindness. The reason for the failure to obtain treatment deserves further attention, and in this connection the following factors may be considered.

Nature of the Condition causing Blindness.

Table XXXI on page 407 shows that there is a considerable variation in the proportion of cases without treatment according to the nature of the condition giving rise to loss of vision. A study of this table reveals the fact that ocular conditions which demand attention on account of pain or sudden loss of sight show a significantly lower than average proportion without treatment. In this category are conjunctivitis (0·98 per cent.), wounds of the eyeball (0·98 per cent.), endophthalmitis (1·2 per cent.), detachment of the retina (2·85 per cent.), interstitial keratitis (3·45 per cent.), ulcer of the cornea (8·2 per cent.), irido-cyclitis (9·2 per cent.), and glaucoma (9·5 per cent.). On the other hand, conditions with an insidious onset such as cataract (33·76 per cent.), myopia (21·04 per cent.), and optic neuritis and atrophy (10·64 per cent.) have a proportion without treatment significantly in excess of the mean for all cases. Congenital anomalies also show a high percentage without treatment but it is difficult to believe that the parents in as many as 22 per cent. of cases blind from congenital conditions had failed to seek specialist advice.

Age of Onset of Blindness.

Another factor which would appear to influence the question of previous treatment is the age of onset of blindness, and this is brought out in the following table where the cases blind from the more important individual eye conditions are set out according to the age of onset of blindness and the proportion without previous specialist treatment.

Eye Condition	Mean Age of Onset of Blindness	Percentage with no Previous Specialist Treatment
Congenital Anomalies	14·33	22·14
Inflammation of Conjunctiva ...	21·38	0·98
Interstitial Keratitis	25·25	3·45
Endophthalmitis	31·88	1·20
Ulcer of Cornea	33·90	8·20
Optic Neuritis or Atrophy	37·81	10·64
Wounds of Eyeball	38·88	0·98
Irido-cyclitis	43·64	9·20
Choroiditis	43·84	12·03
Detachment of Retina	43·84	2·85
Myopia	52·40	20·84
Glaucoma	61·93	9·45
Cataract	65·60	33·76
All Cases	46·60	15·72

It will be observed that generally speaking conditions with a low mean age of blindness show a lower percentage with no previous treatment. As a matter of fact, if conditions in which the mean age of blindness is over 50 years are considered, 22·8 per cent. had no previous treatment, as compared with 10 per cent. for those with blindness occurring below this age. The only important exceptions are congenital anomalies and glaucoma. As

TABLE XXXIV

Relationship between Treatment Received or Recommended and Local Provision of Hospital Beds for Eye Cases

	No Previous Institutional Treatment			Treatment would possibly remove from Blind Category		
	Cases	Total	Per-centage	Cases	Total	Per-centage
Localities with no Hospital Beds for Treatment of Eye Disease	213	1,071	19·89	287	1,109	25·88
Localities with Hospital Beds for Treatment of Eye Disease	274	2,046	13·39	341	2,109	16·17
Total	487	3,117	15·62	628	3,218	19·52

Difference = 6·50±3·32. Difference = 9·71±3·18.

NOTE.—The difference in the totals (1,071 and 1109; 2046 and 2,019) shown in the above table is due to the fact that all questions were not answered in each case.

regards the former conditions, as has been previously mentioned, it is unlikely that the percentage without treatment is as high as was stated; while the fact that glaucoma is insidious in onset and unaccompanied by pain in a considerable number of cases may perhaps account for the higher proportion without treatment.

Accessibility of Facilities for Specialist Treatment.

It is possible that another factor affecting the question of previous treatment is the accessibility or inaccessibility of facilities for the skilled treatment of eye diseases. To test this possibility, the cases under analysis have been grouped in Table XXXIV according to the relationship of previous treatment and the presence or absence of hospital provision for the special treatment of eye cases in the locality.

The figures show that there is a significantly higher proportion of cases without previous special ophthalmic treatment in those localities with no hospital beds for the treatment of eye disease. Further, a higher proportion of cases in whom treatment was regarded as likely to result in the restoration of useful vision is found in localities with no special hospital provision.

Treatment in Relation to the Social Factor.

The various cases have been grouped in the following table according to the social orders described previously on page 361 and in relation to the possibility of treatment resulting in removal from the blind category.

Social Category	Treatment would probably remove from Blind Category:— Number	Percentage	Difference ± Standard Error
2	139	12·50	6·81 ± 3·35
3	599	19·62	0·31 ± 1·61
4	671	20·60	1·29 ± 1·52
5	321	18·98	0·33 ± 2·20
All Cases ...	1,730	19·31	

The only group showing a possibly significant difference is the Social Order 2, where a lower than average proportion recommended treatment is in evidence.

Treatment in Relation to Nationality.

Place of Birth	No. of Cases	Percentage without Previous Treatment
Scotland	2,587	15·08 ± 0·71
England and Wales	124	11·29 ± 2·84
Ireland	329	20·97 ± 2·24
Others	19	Nil
Not Stated	58	Nil
All Cases	3,117	15·66 ± 0·65

Standard error of the difference between the percentage without previous treatment among Irishmen and among all cases is:

$$\sqrt{(15{\cdot}66)\ (84{\cdot}34)\ \left(\frac{1}{329} - \frac{1}{3,117}\right)} = \sqrt{3{\cdot}59076} = 1{\cdot}89.$$

When consideration is given to the relationship of previous special treatment and nationality, it will be observed that the only difference of statistical significance is shown by those of Irish birth, who reveal a somewhat higher proportion than average without specialist treatment.

" Follow-Up " of Cases recommended Further Treatment.

The considerations dealt with above indicate that in a substantial number of the blind restoration of vision may be expected by appropriate treatment. It would be of interest, therefore, to ascertain the number of patients who actually take advantage of treatment and the proportion of those whose vision is sufficiently improved to allow of their removal from the blind register.

During the past few years an attempt has been made to follow up patients examined at the Regional Clinic whose vision was considered by the examining surgeons as likely to benefit by further treatment. Under this scheme of after-care the Home Teachers attached to the Outdoor Mission to the Blind for Glasgow and South-West Scotland make special enquiries regarding those recommended treatment and report progress. Where operative or other treatment has been completed the patient is summoned for re-examination, while the teachers endeavour to persuade defaulters to attend for advice. The scheme has not been in operation for a sufficiently long period to assess properly its value, but the information obtained concerning 279 of the 520 blind persons included in this report whose vision was considered as likely to benefit by treatment may be set out in the following manner (Table XXXV).

TABLE XXXV

Nature of Treatment recommended	Treatment completed			Treatment not carried out or completed				Total
	Number	Now not Blind	Still Blind	Dead	Unwilling	Unfit	Others	
Surgical ...	34	19	15	42	76	57	54	263
Medical ...	5	–	5	2	1	1	7	16
All Cases ...	39	19	20	44	77	58	61	279

The results are disappointing, only 39 or 14 per cent. having completed their treatment. It will be observed, however, that 56 per cent. of those who underwent surgical treatment had sufficient vision restored to warrant their removal from the blind category. This must be regarded as a fairly satisfactory result, having regard to the fact that the prognosis in many cases was considered very doubtful. The table brings into relief the large proportion of cases who were unwilling to undergo treatment. The actual number in this category is 77 or 28 per cent. of the total. This is probably an underestimate, however, because in the group "others" there are—in addition to persons whose treatment was not yet completed or those said to be awaiting treatment—a considerable number who were previously unwilling to attend for advice but after pressure indicated that they were prepared to do so. The large proportion showing an unwillingness to carry out treatment is probably due partly to age and partly to the economic factor. In this connection it is of interest to note that in many continental countries pensions for blindness are given only to the "incurable blind."

(To be concluded)

ANNOTATION

Advanced Cases of Chronic Glaucoma and their Treatment

In the old days it used to be stated that, when the field in glaucoma was contracted to the fixation point, any operation for its relief was more likely than not to have an adverse effect on what little sight remained. The fistulising types of operation have changed our views and at the present time it is generally considered that there is little danger of any further loss of field, however great the contraction present, if one of the newer kinds of operation is performed.

We remember an old gentleman who was not far short of 80 years of age being sent to us by his medical attendant a good many years ago. The latter had met him on one of the most crowded street crossings in the Kensington area, and, as he expressed it, only just managed to prevent his patient being run over by a bus. The old gentleman was quite aware of the fact that his sight was not as good as it had been. On examination he was found to have very advanced glaucoma, with deeply cupped, atrophic discs, and fields of about the size of a sixpence. The tension was little, if at all, raised. At his age we thought it probable that miotic treatment

would prevent him getting much worse. He was kept under regular observation and, in spite of miotics, suffered a further diminution of field. He was much opposed to the idea of an operation and used always to say, whenever we proposed such a line of treatment, "let me continue with the drops for another fortnight." At last we had to tell him that if nothing were done there would probably be no sight left to save at the end of a fortnight. He consented and the operation was safely performed. While in the nursing home, about a week after his operation, he surprised us one day by getting a subacute attack of raised tension in the unoperated eye. This was controlled by eserine and he stoutly refused to have anything further done. He survived for about 18 months and kept a little sight until his death.

When we think over such a case we always call to mind the story of a certain farmer whose lands were much neglected and in a very bad way. He asked some of his friends to advise him what to do. Many different opinions were expressed, but his oldest friend summed up the case in the following sentence, "man, you never ought to have allowed your land to get into this state." Such a mental reflection is perfectly applicable to some of these chronic glaucoma cases.

ABSTRACTS

MISCELLANEOUS

(1) **Findlay, G. M. (London).—The mode of action of chemotherapeutic agents.** *Biochem. Jl.*, p. 1, February, 1942.

(1) **Findlay** states that chemotherapeutic action may be direct or indirect. Except in the case of parasites present in the intestinal canal it is essential that the chemotherapeutic drug should be absorbed into the body, that it should penetrate to the site where the parasites are acting, and that it should not be excreted or converted into an inert form too rapidly. Time must be allowed for the chemotherapeutic action, and in some cases for the conversion of the compound from an inactive into an active form.

When the drug has been brought to the parasite three stages may be distinguished, adsorption, interference with metabolism and death or injury to the parasite so that it may be destroyed by the phagocytes of the host. An adsorbed chemotherapeutic drug may prevent an essential food factor from being absorbed or it may cause a breakdown in metabolism by combining with a specific substrate

or by competing with an essential cell metabolite for an enzyme or a coenzyme. One break in the chain of metabolic reactions may rapidly give rise to others. Specific immune serum and sulphapyridine do not compete for the same receptor group in the pneumococcus and may therefore enhance one another's effects.

Parasites may be killed in the body without the aid of phagocytes, but usually when a parasite has been damaged it is destroyed by the normal defence mechanism of the host.

Indirect action produces such changes in the environment that parasites can no longer grow. Physical changes may prevent growth, the temperature or the pH may be altered, the formation of immune bodies may be stimulated or the character of the cells may be altered. The highly specific action of certain drugs and the no less specific reactions of certain closely allied parasites can be explained by postulating that, after adsorption of the compound at the parasite/solution interface, the nature of the interference with the metabolism of the parasite depends on what groupings in the molecule of the compound come within the influence of other acceptor groups in the parasite; there is thus a multipoint action.

A. F. MACCALLAN.

(2) **Brown, Albert Louis (Cincinnati).—Lime burns of the eye; use of rabbit peritoneum to prevent severe delayed effects.** *Arch. of Ophthal.*, November, 1941.

(2) **Brown's** admirable paper gives a simple and useful method for protecting the eyes in cases of lime burns. Experimental work by the author showed that in rabbits, burnt palpebral conjunctiva in constant contact with the corneal surface, acted as a corrosive agent, even though all the lime had apparently been removed, but if the surfaces were separated by some smooth membrane, the end results, especially with regard to corneal scarring were definitely better. The same was found to be true in human beings and an account is given of four cases in which this treatment was applied, with good results. The technique of transplantation of rabbit peritoneum is briefly as follows:—The damaged eye is carefully irrigated with warm water, and all visible particles of lime are removed—canthotomy may be necessary if there is much swelling. A well grown rabbit is killed by ether and after shaving, a mid line abdominal incision is made, exposing the peritoneum. A section of this, $10 \times 4{\cdot}5$ cm. is removed, cleaned of debris and passed through three successive washes of normal saline. Two double armed sutures are passed through the tissue, 2·5 cm. apart and about 3 cm. from one end, and another similar pair 3 cm. from the other end. One pair of needles is then passed through the upper fornix emerging below the brow and the tissue pushed gently into the upper fornix

with a bone spatula. The process is then repeated through the lower fornix with the other pair of sutures. In each case these are tied over buttons to prevent their cutting through the skin. The ends of the strip of peritoneum are allowed to hang out between the lids and the strip is usually left in situ for 3 weeks.

F. A. W-N.

(3) **Evans, William H., Odom, Robert E. and Wenaas, Elmer J. (Youngstown, Ohio).—Krukenburg's spindle. A study of two hundred and two collected cases.** *Arch. of Ophthal.*, December, 1941.

(3) **Evans, Odom** and **Wenaas'** paper is based on a review of 202 cases of Krukenberg's spindle, of which 95 were collected through a questionnaire, the remaining 107 coming from the literature. The condition is not particularly rare, and can be described as a narrow or rounded oval of brown pigment, 0·5 to 3 mm. wide and 2 to 6 mm. long, placed vertically in the posterior layer of the centre of the cornea. The pigment is densest at the centre. In 75 per cent. of cases the condition was bilateral, in some it remained unchanged, while in others the pigment increased or decreased in amount. Krukenberg's spindle produces no characteristic symptoms, the majority of the patients being unaware of the pigmentation of the cornea, and consulting the oculist for errors of refraction, which in 70 per cent. were of myopic character.

With regard to age, 45 per cent of the cases were between 30 and 50 years of age, in only 2·5 per cent. was the age under 20 years, while 25 per cent. were over 50. There were twice as many women affected as men, though in the under 30 group this ratio was reversed. The same ratio applies to iris pigmentation, the condition being twice as frequent in persons with dark irides. The most consistent aetiological factor was some disturbance of ocular pigmentation of inflammatory, senile or degenerative origin. Heredity and general diseases were not of importance, neither is there any notable association with persistent pupillary membrane.

It would appear that some local change in the corneal endothelium or some peculiarity in the circulation of the aqueous must account for the deposition of the pigment in a fusiform vertical line.

F. A. W-N.

(4) **O'Brien, C. S. and Swan, K. C. (Iowa City).—Carbaminoylcholine chloride in the treatment of glaucoma simplex.** *Arch. of Ophthal.*, February, 1942.

(4) Carbaminoylcholine is a synthetic choline derivative which acts principally by parasympathetic stimulation. Reports in the literature of its effects have been conflicting, so **O'Brien** and **Swan**

decided to investigate these. An important factor is the permeability of the cornea to the drug. This is only slight because carbaminoylcholine does not become a lipoid soluble free base at any pH, but when a surface tension-reducing agent was used, the permeability increased. The agent employed was zephiran, a mixture of alkyl, dimethyl, and benzyl ammonium chlorides which in concentrations of 0·02 to 0·03 per cent. has no injurious effects. Trials showed that the use of this solution with a 1·5 per cent. concentration of carbaminoylcholine produced a more lasting and greater degree of miosis than when zephiran was not employed. The combined solution was also found to be more effective than 2 per cent. pilocarpine, both in normal and in glaucomatous patients. In the latter group the average tension difference was 5 mm. Hg. In a group of cases of advanced glaucoma simplex 2 per cent. pilocarpine proved ineffective, but 1·5 per cent. carbaminoylcholine in 0·03 per cent. zephiran maintained the tension below 25 mm. Hg Schiotz without further loss of visual field over periods up to 20 months. A certain amount of pain in the eye and headache were usually noted after the initial instillations, but were uncommon after the third day of treatment and in only one case was local sensitivity observed. The solution keeps quite well and samples remained pharmacologically active after being kept at room temperature for over a year.

F. A. W-N.

(5) **Kinsey, V. Everett, Grant, Morton, and Cogan, David G. (Boston).—Water movement and the eye.** *Arch. of Ophthal.*, February, 1942.

(5) **Kinsey, Grant** and **Cogan's** research was undertaken with the object of determining the rate at which water enters and leaves the eye. For this purpose heavy water (D_2O) was used as a tracer. Its diffusion rate is practically identical with that of ordinary water, yet its density is about 10 per cent. greater. Thus the proportion of D_2O to H_2O in any mixture can be calculated from the specific gravity of the mixture. By using this method it was found that one half of the water in the aqueous of the rabbit was replaced every 2·7 minutes, which corresponds with a total water movement into or out of the anterior chamber of 50 cu. mm. per minute. The corresponding figure for the vitreous was 85 cu. mm. per minute. In the monkey one half of the aqueous was replaced in 7 minutes, corresponding to a total water movement of more than 13 cu. mm. per minute. The quantity of water going from the aqueous to the vitreous and lens of the rabbit represented only a small proportion of the total water movement of the aqueous.

F. A. W-N.

(6) **Sironi (Milan).—Bilateral ectopia lentis with arachnoidactylia. (Ectopia lentis bilaterale simmetrica e aracnoidattilia. Sindrome di Marfan).** *Boll. d'Ocul.*, August, 1939.

(6) This patient was a boy, aged 11 years, in whose history nothing abnormal could be found. The parents did not notice any defect of the eye until schooling was begun; it was then found that his vision was very defective and could not be improved by any lens. At the clinic, the extreme length of arms and legs was noticed. It is well known that the syndrome is often associated with defects in development of the lens and here it was found that both lenses were badly formed and ectopic. The slit-lamp showed that the suspensory ligament was visible in the lower half of the pupil, the fibres attached to the anterior surface seemed wanting in the inner part of the left eye, and here the edge of the lens was straight. Scattered among the fibres were very small dark brown masses.

Radioscopy showed the limb bones elongated; the skull was dolicho-cephalic with normal sella turcica.

Since no lens could improve the sight (finger-counting at 3 metres in the better eye) Professor Vollaro removed the right lens by discission; the corrected vision after the operation was 4/10.

HAROLD GRIMSDALE.

(7) **Oliphant, J. W., Powell, W. F. and Perrin, T. L. (Bethesda, Md.).—Sulphadiazine in lymphogranuloma venereum ophthalmitis.** *Jl. Amer. Med. Assoc.*, March 21, 1942.

(7) This is a report of a case of conjunctivitis caused by the virus of lymphogranuloma venereum or inguinale. This sixth venereal disease is defined by Stannus as a human contagious disease, acquired venereally; due to a filterable virus communicable to certain experimental animals; characterized by an initial lesion on the external genitalia; followed by a subacute or chronic inflammation in the regional lymphatic glands with the production of multiple foci of suppuration. In the male, elephantiasis of the penis and scrotum may result. In the female, similar pathological changes extend to the intrapelvic glands and connective tissues. Stricture of the rectum may result. Microscopically virus inclusion bodies may be found after suitable staining in both mononuclear leucocytes and endothelial cells. The virus cannot be cultivated, but its virulence can be kept up by passage through mouse brains.

The disease may be recognized by the Frei test under careful conditions. Material from excised glands, inactivated by heat, is injected under the skin of the suspected person, when, in positive cases a dark-red papule 1·5 cm. in diameter develops in 36 hours.

Infection of the eye by this virus is an unusual condition, but several cases have been reported.

A laboratory worker developed an inflammation with a mucoid discharge and was first seen by an oculist a fortnight later. He had full visual acuity in both eyes; on eversion of the lids there was found congestion of the palpebral conjunctiva with many bleb-like papules which suggested the possibility of trachoma, but slit-lamp examination showed the absence of neo-vascularization of the upper fifth of the normally clear cornea thereby invalidating such a diagnosis. A fortnight later keratitis appeared. Various forms of treatment had proved unsuccessful, and there were no definite bacteriological findings.

It was suspected that the patient might have been infected with some virus with which he had come in contact in the laboratory, so mice were inoculated intracranially with material from his eye. The inoculated animals remained healthy for about a fortnight when three of the five inoculated showed signs suggestive of infection with the virus of lymphogranuloma venereum. When it seemed that the diagnosis was established therapy by sulphadiazine was begun; this had previously been found effective against experimental infection in mice. The dose was 1 gramme by mouth three times a day after meals. After ten days treatment, including rest periods, recovery was considered to be complete; 30 grammes in all of the drug had been taken. No details of the conjunctival condition are reported after recovery.

Following recovery a Frei test was done and the reaction was interpreted as positive. The virus was maintained by serial passage of infected mouse brains. Examination of tissue sections showed brain lesions identical with those previously found in studies of two different strains of virus of lymphogranuloma venereum.

It may be mentioned that Palmer, Kirsner and Rodaniche (*Jl. Amer. Med. Assoc.*, Vol. CXVIII, No. 7, p. 517), found that mice may be protected completely from lethal doses injected intracerebrally by the administration of a diet containing 1 per cent. sulphanilamide. However, the virus was recovered in high concentration in each instance, indicating therefore that although chemotherapy had protected the animal from disease it had not accomplished an in vivo sterilization nor an attenuation of the virus.

A. F. MACCALLAN.

(8) **Bellows, John G. and Chinn, Herman (Chicago).—Theories of cataract.** *Arch. of Ophthal.*, December, 1941.

(8) **Bellows** and **Chinn** consider the possible causes of cataract under eight different headings:— (1) *Endocrine* dysfunction. Clinical and experimental work have demonstrated the association between diabetes and cataract for over a century. The most likely explanation is that disturbances of dextrose and salt concentrations

in the blood, aqueous and lens set up an abnormal interchange of water which causes first, refractive changes, and later, opacities. Hypoparathyroid cataract has probably a toxic basis due to accumulation in the lens of tyramine, histamine, and guanidine, substances whose removal from the body is controlled by the parathyroid glands. Various skin diseases, *e.g.* chronic eczema, are associated with cataract, which is not surprising in view of the ectodermal origin of the lens. An endocrine defect is postulated for these conditions. In some cases excess of hormone may be responsible, thus cataract was produced in a mouse by injection of adrenalin, an effect which was facilitated by administration of histamine.

(2) Decrease in nutrient supply will obviously cause opacity of the lens, hence its appearance in such diverse conditions as uveal vascular stasis (*e.g.* acute glaucoma), ergot poisoning (arterial spasm), severe infective diseases (cachectic state of patient), and generalised avitaminosis, especially if the supply of riboflavin is deficient. Ascorbic acid would not seem to be so important since scurvy is rarely accompanied by cataract.

(3) Intoxication of the lens. Substances such as thallium, dinitrophenol and naphthalene are well known as producers of cataract, but whether they act directly by poisoning the fibres, or indirectly by upsetting the metabolism of the lens, is uncertain. An example of this is the hyperglycaemic state produced by naphthalene in the rabbit and the observation that the development of cataract can be retarded by giving insulin. Galactose cataract may also be toxic in origin, because this substance is toxic to tissue cultures of lens epithelium. Since the liver is the principal detoxicating organ of the body, there may be a relationship between hepatic dysfunction and cataract.

(4) Radiant energy. The high incidence of cataract in India and the Arctic regions is thought by some to be evidence in favour of its production by ultra-violet light. The influence of heat is well-known (*e.g.* glass blowers' cataract) but it may be indirect, because explanted lenses exposed to infra-red radiation do not develop opacities unless covered by iris tissue.

(5) Capsular alterations have probably no direct bearing on ordinary cases since the permeability of the capsule of a cataractous lens is approximately the same as that of a normal one. The deposition of cells, pigment, and inflammatory material on the capsule in prolonged irido-cyclitis may, however, interfere with the normal fluid traffic of the lens and so cause opacities to form.

(6) Osmotic changes are probably of prime importance. Anything which tends to upset the equilibrium of osmotic forces between the blood, the aqueous and the lens is a potential cause of cataract. Examples of this are the cataracts following the intravenous administration of hypertonic solutions of various electrolytes

and non-electrolytes, though other factors must also operate because different substances in solution of the same tonicity show wide variations in their effects. It is probable that any compound, not readily utilised by the body and reaching a high concentration in the blood and aqueous, will produce cataract by osmotic changes in the lens if administered in adequate quantities.

(7) Refractive errors are probably not of importance since the prolonged use of miotics produces no lens changes in spite of sustained contraction of the ciliary muscle.

(8) Hereditary factors are of undoubted importance. A good example is Vogt's observation that in uniovular twins cataracts identical in type and location occur in the two, even when their environments differ greatly.

F. A. W-N.

(9) **Pokrovski, A. T.—Treatment of trachoma.** *Soviet Medecine*, 1940-2.

(9) Though this article is intended for the general practitioner, it is rather over-elaborate and discursive, especially in its medical aspect. The teaching is sound and based on practice and observations in Prof. Pokrovski's clinic. He points to the fact that the disease does not lend itself to cut and dried division into varieties and stages as, more often than not, the clinical picture is a mixed one. Until the causal agent of trachoma is established, the therapy must of necessity remain symptomatic. There is no routine treatment applicable to all cases. Each case must be judged on its own merits and the whole treatment varied accordingly. The patient must be looked at as a whole and, where necessary, measures should be taken to counter any other ailments present, general or local. If the general condition of the patient calls for improvement, change of climate and environment, appropriate diet and other non-specific and specific stimulating measures should be employed.

Locally the old tried remedies form the mainstay. In acute trachoma, generally presenting catarrhal manifestations owing to superimposed Koch-Weeks and diplobacillary or other infections, silver compounds—silver nitrate, argyrol, protargol and the like—in solutions of various strengths or in the form of ointment—are exhibited by being instilled into the conjunctival sac, or by massaging the affected tissue with the medicament. In the chronic disease optochin, quinine bisulphate, zinc sulphate and copper sulphate, though not specific, are undoubtedly helpful; as copper sulphate is more penetrating than silver salts, it is especially useful in infiltrating trachoma; but some patients are intolerant of copper, especially scrofulous ones. Where there is no ulcer of the cornea or other contra-indication, touching the fleshy pannus with solid copper sulphate is helpful; but the operation calls for skill and judgment

and is best left to the specialist. In some cases of pannus, flooding the conjunctival sac with 2 per cent. lapis and then washing it out with water gives excellent results. Subconjunctival injection of copper compounds or mercury cyanide in weak solution causes acute irritation and pain and has no advantage over the usual methods; the same may be said of tracholysine (Angelucci).

Chaulmoogra oil rubbed into the diseased tissue gives, as a rule, excellent results. But as this oil has to come from abroad, "peril oil" made from indigenous raw materials takes its place in Russia and is found to be a good substitute. Painting the trachomatous conjunctiva with tinct. iod. or iodic acid and then instilling xeroform ointment into the conjunctival sac has also been found helpful.

Injection of 1 c.c. to 2 c.c. of the patient's own blood subconjunctivally is also recommended for pannus.

Mechano-surgical methods have their own place in trachoma therapy. Expression of granules should be carried out avoiding unnecessary trauma in the tissues. It is usual to apply lapis between expressions. Filatoff finds the results are equally good without lapis.

Pokrovski does not recommend removal of the adenoid layer of the conjunctiva *in toto* with brush, spoon, etc., as it involves destruction of both diseased and healthy tissue. Excision of the conjunctival fornix or the tarsus or both is employed in extreme cases; this procedure should be left to the specialist as should shaving of pannus. Physiotherapy also finds its use in trachoma. As adjunct to the usual treatment, ionisation with salts of copper, zinc, sodium, etc., gives excellent results, especially after granules have been expressed. Radiation with X-ray, radium, quartz lamp and sunlight are also helpful. For the local medical treatment to be effective, especially in regard to pannus, it is essential to get the specialist to remedy surgically complications such as entropion, ectropion, trichiasis, etc. Intra-venous injections of tartar emetic are of doubtful value and novocaine block is ineffective.

(N.B.—Silver nitrate is known as Lapis-lunaris. Both aluminated copper and ammoniated copper go by the name of lapis divinus. In his paper Pokrovski uses the term "lapis" without specification. It would be safe to assume that silver nitrate is employed as a 1 per cent. or 2 per cent. solution and lapis divinus as a stick.)

D. V. GIRI.

(10) **MacNalty, Sir Arthur (London).—Industrial eye injuries.** *Brit. Med. Jl.*, February 7, 1942.

(10) **Sir Arthur MacNalty's** lecture was delivered at Oxford on November 28, 1941, as part of the course for the D.O. Oxon. He classifies the industrial diseases affecting eyesight under three heads: (1) results of exposure to heat rays; (2) Miners' nystagmus; (3) toxic effects of certain substances. In the first of these he discusses

glass-workers' and iron-workers' cataract and in the third such substances as lead, benzene derivatives, carbon bisulphide and methyl alcohol. Apart from Miners' nystagmus "the M.O.H. Departmental Committee found that the number of cases of serious impairment of vision caused by these diseases was in all probability very small. The dangers to eyesight involved are, however, serious, and the Committee noted that this relative immunity from grave eye injury is dependent on the maintenance of the stringent precautions taken." The use of appropriate glasses ensures prevention of the lens changes due to heat and to ultra-violet radiation, and protection against corneal ulceration due to pitch is afforded by goggles or pieces of crêpe of fine mesh.

With regard to industrial poisons affecting the eyes it is to be noted that those due to lead now seldom come before the ophthalmologist. The risks are there but methods of prevention have been most successful. No cases of optic neuritis caused by carbon bisulphide have come to the notice of the Ministry of Labour during recent years.

The occupations involving risk of eye accidents are discussed under the headings of accidents in factories, mines and quarries, agricultural and other occupations. A short paragraph on notification leads to a long section on prevention which is excellent. The question of compensation is touched upon and in his conclusions Sir Arthur says, "it is encouraging to know that modern methods of prevention have greatly reduced the risk of eye lesions from chemical and other processes, and that the results of medical research and progress are promptly applied. Eye accidents in mines, quarries, and factories constitute by far the largest proportion of cases of impaired eyesight or of blindness among industrial workers. Their prevention is largely a question of periodical medical examination, of education, of the uses of protective appliances in industry, and of prompt ophthalmic treatment."

R. R. J.

(11) **Tooke, Fred. T. and Nicholls, John V. V. (Montreal).—On the character and co-incidence of retinal haemorrhages occurring in diabetes.** *Can. Med. Assoc. Jl.*, January, 1942.

(11) This paper is complementary to previous papers by **Tooke** and **Nicholls** on the findings in the fundi of 100 patients suffering from cardio-vascular hypertension. They here deal in a similar way with the retinal haemorrhages in 100 cases of diabetes examined ophthalmoscopically, and of which precise records were kept. Haemorrhages in this series occurred in 23 cases. The youngest patient was 15 years of age; only 12 patients were under the fifth decade. Of the 100 cases 24 were male and 76 female. In only one instance were there symptoms of a cerebral accident, while in

cardio-vascular hypertension 21 cases out of the 100 were so reported. Of the cases showing retinal haemorrhages 19 belonged to the female sex of an average age of 56·4 years. There were 4 males manifesting retinal haemorrhages, of an average age of 66·8 years. Of the haemorrhagic cases the average blood sugar before eating was 197, while after eating it rose to 245.

Nineteen cases of haemorrhage were associated with cardio-vascular hypertension; of these 15 were petechial in character, while only 4 were large or flame-shaped. Thirty-one cases showed a definitely high blood pressure and yet demonstrated no haemorrhages.

In a convenient table the 100 cases in diabetes and those in primary hypertension are contrasted with regard to age, blood pressure, creatinine, non-protein nitrogen, urine, specific gravity, albumen, casts and blood sugar before and after meals. With regard to the urine findings it is of interest to note that albumen was present in 50 per cent. of the cases of primary hypertension, but in diabetes 71 of 98 cases examined showed negative findings. In the cardio-vascular hypertension series 20 per cent. of cases showed the presence of hyaline casts, while only 6 per cent. in the diabetic series showed casts.

The paper ends with a good discussion on both ancient and modern views on this subject. It was read at the 72nd annual meeting of the section of Ophthalmology, Canadian Medical Association on June 27, 1941.

R. R. J.

(12) **McGregor, Ian S. (Glasgow).—Orbital cellulitis from gas-producing organisms.** *Brit. Med. Jl.*, February 28, 1942.

(12) The case described by **McGregor**, from the Tennent Memorial Institute, is of great interest. The condition occurred in a male, aged 67 years, and arose from nasal sinus infection. For five days before admission on September 27, 1941, he had complained of severe pain in the right eye with much swelling of the lids. Small incisions had been made in the outer third of each eye lid and brown pus and bubbles of gas were escaping from these wounds. The smell was appalling. There was marked proptosis and the globe was immobile; the cornea was intact and purple folds of conjunctiva overhung the margin. The man was very ill, temperature varying between 100° and 106° F. Antral lavage on the day after admission was positive on the right side. This lavage was repeated every few days over a period of six weeks. Radiographs showed disease of the right antrum and right ethmoidal cells. A radical antral operation was deferred until the man was in better condition, but two days after admission the anterior end of the right middle turbinate was removed. Anti-gas-gangrene serum and sulphathiazole were used from the outset, both intravenously and intra-muscularly. Details are shown in a table. Lid swelling

subsided very slowly, the cornea developed a marginal keratitis, but this healed. The proptosis receded and on November 11, it was possible to examine the fundus. The optic nerve was then atrophic and there was no evidence of haemorrhages or exudates. The right eye was quite blind. The left eye had 6/6 and J.1 after some hypermetropic correction. The field of this eye was full and there was no evidence of uveitis in either eye. The Wassermann reaction was negative.

Bacteriological examination showed the presence of various cocci and a few Gram-positive bacilli from a smear and, on culture, staph. aureus. In a later stab culture a Gram-positive bacillus with filamentous forms, some of which showed swellings resembling spores was grown.

In the discussion the author shows how much rarer gas gangrene of the orbit is than of the globe itself. He ends as follows:—"As there was no preceding optic neuritis and no sign of uveitis in the above case, we may assume that the infection had not spread from the globe to the nerve. Atrophy of the nerve was observed a fortnight after the onset of the illness. The findings may be reasonably explained by an exudative perineuritis or neuritis with early thrombosis of the nutrient vessels, the posterior part of the optic nerve being infected."

The list of references extends between Fraser's Report to the Med. Research Committee in 1919 to Cross, in the *Lancet* for 1941, Vol. II, p. 515.

R. R. J.

BOOK NOTICES

Binocular Imbalance. By MARGARET DOBSON. Crown 8vo., p.p. VI and 96. Illustrations 18. Price 10/6 net.

Dr. Dobson is well known for her work on the extra-ocular muscles, and in this book, her main object is to show how a correct relationship can be obtained between the relative amplitudes of convergence and accommodation. The subject is complex, and one has the feeling that the book suffers from perhaps having been written in a hurry and not having been more deliberately planned. The author also assumes that her readers have the same knowledge of terms as she herself possesses. An example of this is shown on page 2 where it is laid down that positive and negative relative accommodation must bear a normal relationship to each other, though these terms are not defined until page 30. In covering what to many readers will be new ground, an introductory chapter containing definitions of special terms, such as duction, relative convergence, etc., would have been of service.

Other criticisms are that the actions of the extra-ocular muscles might have been more clearly explained, and that although it is interesting to read about dynamic retinoscopy, the section dealing with the ordinary static procedure and with subjective testing might have been omitted. Owing presumably to considerations of space, these have had to be much condensed and as the book is obviously written for those who have already more than a nodding acquaintance with ophthalmology their omission would be justified, particularly as this would have left more room for subject matter which is the raison d'être of the book.

Lack of planning is also evident in the following statement (p. 32) "After refraction it is important to note the equality or otherwise of the retinal images in each eye," without the slightest indication of how this is to be done beyond a reference to the work of various writers, among whom the name of Ames, the pioneer of this work, fails to appear.

There is much that is good in this book, however, and the reader will obtain useful information on the treatment of heterophoria and of asthenopia generally. Some will be unconventional, but it is none the worse for this and in fact it is one of the chief merits of "Ocular Imbalance" that it is not a conventional text book, but is a highly personal account of procedures which have been adopted by an ophthalmologist of considerable experience and originality.

Victorian Doctor. The Life of Sir William Wilde. By T. G. WILSON, M.B., Litt.D., F.R.C.S.I., M.R.I.A. London: Methuen and Co., Ltd. 1942. Price 15/-.

A brief memoir of Sir William Wilde appeared in our second volume; it was written by the late J. B. Story. There was more than a chance as the years went by that Wilde's very great services to ophthalmology and aural surgery would be forgotten and in fact he was now in danger of being considered only as the father of the brilliant Oscar Wilde.

Dr. Wilson has done a service to medicine in his biography, which delightfully written and illustrated by himself, helps to correct several errors in the biographies of Oscar. We have no hesitation in saying that Victorian Doctor takes a very high place among biographical works and is worthy of standing alongside the lives of Lord Lister and Pasteur.

The son of a doctor, whose family originally came from the North of England, Wilde's mother was a member of an important Irish family in Connaught. He was apprenticed to the celebrated Colles and after qualification made a prolonged tour in charge of a wealthy invalid. They visited Teneriffe, the Levant, Egypt and Palestine, and Wilde's narrative of his tour was published in two volumes early in 1839, the author being then in his 30th year.

Wilde put in much post-graduate work in London and Vienna, and on his return to Dublin founded St. Mark's Hospital. Not content with an enormous practice in ophthalmology and aural surgery, Wilde was responsible for the Census for many decades. He was a medical editor, he was a noted authority on Irish antiquities and towards the end of his career catastrophe overtook him in the shape of a prosecution in the Courts. It was an unsavoury business and although the plaintiff won her case and was awarded only a farthing's damages, it must have done incalculable harm to Wilde both professionally and socially.

Woven in with Wilde's life story are good accounts of the awful famine years in Ireland, the hungry forties, details of Swift's closing years, sidelights on Lever, and most of the revolutionaries in Ireland in the middle of last century, literature, art and poetry. We strongly advise all ophthalmic surgeons to read this book; in these worrying times, if they do, they will be sure of having a few days in which their minds can be switched off from present day realities to the delightful atmosphere of Ireland in the last century, and they will be thankful to the author, as the reviewer has been, for a rare treat.

CORRESPONDENCE

THE NEEDS OF THE SERVICES

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—The interesting correspondence opened in your Journal of December, 1941, by Mr. Rugg Gunn, has been read by me with considerable concern because each writer, with the possible exception of the initiator of the correspondence, seems to have overlooked one paramount fact—namely, that we must win this war and use every facility available to achieve this. This is certainly not the time for weighing up post-war consequences and withholding our hand from this or that course because of later repercussions to our personal practices.

The second fact that seems to have been entirely overlooked by everyone is that conditions in Great Britain are not comparable with conditions overseas and especially in the battle areas. Here distances are immense and supplies very difficult at times.

Thirdly, we are almost in the fourth year of the war (or will be when this letter is published) and men who joined the Forces in 1939 are due for a second refraction in the immediate future. A number arrive overseas without glasses and many lose their glasses in action, so how can the bulk of refraction work in the Army be

considered to be completed? It is just time to begin the work again.

Fourthly, as 70 per cent. of the Army ophthalmic work is refractions and as the amount of eye operative work undertaken is almost negligible at the present, and will remain so until a second front is formed, why not employ supervised opticians who are capable of doing refraction work when there are obviously insufficient ophthalmic surgeons to perform the large volume of this work promptly and thus prevent soldiers from being immobilised in Base Depots whilst awaiting refraction and glasses.

I had the privilege of working with and observing the organisation of many Allied Ophthalmic Units in the Middle East for eighteen months and, without prejudice, I am certain that the staffing and organisation of the ophthalmic units of the Australian General Hospitals and Australian Optical Workshops are, for the purposes of this war and its winning, by far the most practical and efficient I have met. The refraction work is done well by opticians, the out-patient waiting list surprisingly low, the supply of spectacles speedy and reliable, and I attribute these facts to the discerning use of the services of trained and registered opticians, all under the surveillance of ophthalmic surgeons. There is one ophthalmic surgeon and one optician to each Australian General Hospital, with one Australian Optical Workshop (staffed by two opticians under medical supervision) to approximately every two hospitals. It is not ideal and would not be contemplated in civil practice, but we are fighting a deadly war and every service must run efficiently and speedily. To suggest that the services of these opticians should be dispensed with (thus producing an obvious slowing-up of the eye service) in order to save the practices of ophthalmic surgeons after the war is beyond my conception and I simply reply that, if we lose this war, there will be no payable practices for any eye surgeons whatsoever, throughout the Empire.

I therefore submit the Australian system to your readers and leave for their consideration the excellent results of such a service.

Yours faithfully,

J. BRUCE HAMILTON,
Major.

7th AUSTRALIAN GENERAL
HOSPITAL, A.I.F., *July* 12, 1942.

TWO CASES OF ORTHOPTIC INTEREST

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—With reference to the article entitled "Two Cases of Orthoptic Interest" by E. B. Alabaster, C. Rudd and M. Tree, which appeared in your last number, it appears that the two cases

quoted are certainly "of interest," but, I think, hardly in the direction that the authors would wish.

They have described the clinical course of two illustrative cases, implying that orthoptic treatment was probably of doubtful value in the first case, and that although no such treatment was given in the second case, the absence of ocular symptoms, in spite of the displacement of the eyeball, was an astonishing fact.

Both cases call for comment. I venture to suggest that as the authors present them, they show a misconception of the scope of orthoptic treatment, a lack of appreciation of the value of the simple cover test as an aid to demonstrate the presence of single binocular vision, and an inability to grasp the fact that mechanical displacement of the eyeball is not necessarily accompanied by a deviation of the visual axes when looking straight ahead.

The first case quoted is one of periodic convergent squint of the accommodational type associated with hypermetropic astigmatism, for which the most important treatment is obviously the correction of the error of refraction, as was in fact carried out. If in such a case the eyes are "straight" when glasses are worn, *i.e.* if single binocular vision is present, as can be demonstrated by means of the properly applied cover test, then the normal development of the binocular reflexes will in most cases occur whether orthoptic treatment is employed or not, *provided* that the glasses are worn habitually.

Orthoptic treatment, however, is in such instances of great value in helping to overcome the tendency for ocular neglect (or suppression), in helping to stabilise the binocular reflexes, and in teaching the patient "control," so that deviation of the visual axes does not take place, even periodically, or on such occasions when the glasses are not worn.

It should be remembered that the presence of an angle of deviation of +6 (or even as much as +15) as measured by the Synoptophore, or as demonstrated by means of the Maddox Rod does not imply that the patient has a manifest squint. The power of fusion and the ability to overcome the "convergence tendency" may enable a patient with a large degree of latent deviation to obtain single binocular vision quite easily.

The orthoptic report, of the first case quoted, dated November 25, 1937 (after a course of orthoptic treatment which commenced in February, 1935) states "Fusion is 5°, and abduction to 0°," which sounds a satisfactory state of affairs: and yet in the next sentence one reads ". . . . it was decided that further orthoptic treatment should be discontinued and the case was discharged as a cosmetic result." I would venture to suggest that at this stage, and no doubt even before orthoptic treatment was given, the patient probably had single binocular vision (except when periodically squinting), although the authors give no evidence to substantiate or

disprove this. The result, therefore, far from being merely "cosmetic" was in fact probably a good functional one. It was only necessary for the "passage of time" to elapse, with the natural further refinement of the binocular reflexes before full stereoscopic vision developed and a further decrease in the angle of deviation occurred, as measured on the Synoptophore, before the final pronouncement of a "cure" could be made. (As Chavasse* aptly states "leave 'em alone and they'll come home.")

The value of giving any one case a course of orthoptic treatment comprising as many as 197 more or less consecutive visits is a point that is open to question, but at the end of that period to pronounce the case merely as a "cosmetic cure" could only indicate that the time spent on the treatment was employed to little purpose!

In the second case it would seem obvious that orthoptic treatment was certainly not indicated. In spite of the displacement of the right eye the Maddox Rod test showed the presence of Orthophoria when the patient looked straight ahead.

This case clearly demonstrates, that mechanical displacement of the eyeball is not necessarily associated with deviation of the visual axes, and therefore not necessarily associated with heterophoria or heterotropia.

It is entirely a question as to whether the "displacement" of the eyeball is, or is not, associated with a disproportionate tilting of the eyeball causing a loss of the correct directional alignment of the visual axes. If the eyeball is merely displaced without any "disproportionate tilting" no deviation occurs, either latent or manifest, and no abnormality of binocular vision need be expected.

The amount of "displacement" does not of necessity bear any relationship to the phenomenon of deviation, a large amount of displacement may occur without any deviation of the visual axes, on the other hand a small amount of displacement may be accompanied by a large degree of deviation.

It, however, often happens that in the case of a displaced eyeball, such as is described, heterophoria may occur when vertical or horizontal movements are undertaken, in which case the strong power of binocular vision present is frequently sufficient to overcome the latent deviation, especially if it is unnecessary for such movements to be exercised for any length of time. On the other hand, if the deviation is too great for this to occur "Monocular neglect" may take place when such movements are carried out and in this way diplopia avoided.

The case as quoted is a type that is not uncommon, in which the eyeball is displaced as a whole downwards, slightly backwards and tilted somewhat backwards causing a relative paresis of depression and of elevation. The more successful treatment is the reduction of the fracture of the floor of the orbit, carried out shortly after the

* CHAVASSE, F. B. (1939).—Worth's Squint.

injury, so that the normal anatomical relations of the part may be restored.

On the subject of ocular deviation and binocular vision in general there appears to be a tendency for vagueness of thought, procrastination and indecision, due largely to a lack of detailed clinical examination, and the article discussed in the letter, although giving an admirable clinical description of two interesting cases, rather than helping to clarify the subject, appears to make something which is simple appear to be complicated.

Yours truly,

T. KEITH LYLE.

42, CHARLES STREET,
BERKELEY SQUARE, W. 1.
July 30, 1942.

NOTES

Honours

WE understand that Major H. B. Stallard has been mentioned in Despatches for devotion to duty and for service of exceptional merit.

Ophthalmology is well represented in a recent list of eleven distinguished medical men to have been elected Honorary Fellows of the Royal Society of Medicine by the award to Sir John Parsons, F.R.S., and to Sir Henry Lindo Ferguson, of Otago, New Zealand.

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The Leslie Dana Gold Medal

IT was announced on May 30, in New York City that the award of the Leslie Dana Gold Medal for the current year had been made to Lewis H. Carris, Director Emeritus of the National Society for the prevention of blindness.

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Post-graduate Lectures in Ophthalmology at Glasgow

THE usual Autumn course of lectures has been arranged as follows:—Wednesday, September 9, Professor Riddell—"Certain Aspects of Retinal Function"; Wednesday, September 16, Dr. Paul Bacsich—"Comparative Anatomy of the Retina"; Wednesday, September 23, Professor Loewenstein—"Lipoidal Changes in the Retina"; Wednesday, September 30, Professor Ballantyne—"Pathology of the Retinal Veins"; Thursday, October 1, Mr. Eugene Wolff—"Normal Histology of the Retina"; Friday, October 2, Mr. Eugene Wolff—"Pathological Histology of the Retina."

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Special Notice

WE are asked by the Ministry of Information to state that the fact that goods made of raw materials in short supply owing to war conditions are advertised in this journal should not be taken as an indication that they are necessarily available for export.